

Validity and Reliability of the 3-E Tool for Evaluating the Curriculum Support Intervention in Uganda

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ABSTRACT

This study determined psychometric properties of 3-ET, an instrument specifically designed to track the effects of a curriculum support intervention created to enhance the delivery of the national curriculum in a war zone in Uganda. The instrument was developed through brain storm and expert review before being committed to structural and reliability testing using Exploratory Factor analysis (EFA). The 88 variables of 3-ET were reduced to 73; five distinct sub-scales emerged. Sub-scale 1, measured core education support functions and services. Sub-scale 2, assessed aesthetics/efficiency. Sub-scale 3, focused on barriers to stakeholder participation. Sub-scale 4 measured peacefulness and gender sensitivity of learning environments. Sub-scale 5 assessed pupil participation. 3-ET has acceptable structural validity and internal consistence reliability. It can be used to test effectiveness of the REPLICA intervention. Its applicability in other conflict and non-conflict contexts needs review.

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1. INTRODUCTION

In 2005/6, the Ministry of Education and Sports introduced a new curriculum support intervention branded REPLICA-for revitalizing education, participation and learning in conflict areas. The intervention entailed introduction of peace education, psychosocial support, community integration, leadership and governance training, promotion of girls' education and use of performing arts in learning into the formal teaching and learning program of the affected schools and school communities. Field anecdotes and official statistics had painted a grim picture of education performance in the war zone specifically because of the war related psychosocial and physical problems. The region had low net intake (NIR), completion and pass rates of 25-50%, 23-35%, and 1-24% respectively [1] and wide spread Psycho-trauma [2].

The learning centres that had been created within the internally displaced camps to ensure safety and better administration of schools had instead faced several challenges that directly constrained teaching, learning and stakeholder participation in education and ultimately the educational competitiveness of the entire region. The main challenges included overcrowding, filthy learning environments, entrenched culture of violence and administrative problems. Others were trauma, apathy and uncertainty among teachers and learners [3]-[4], over-stretched and degraded facilities; apathetic, unsupportive and dysfunctional school-communities, and traumatised human resources. Moreover the school-community interface had been distressed by war instigated suspicion and mistrust. Government was concerned about the poor academic performance, the lack of trained staff and predictability in the war zone. The REPLICA program was therefore developed as a curriculum support material. It was modelled around the recommendations of the International Network for Education in Emergency (INEE) which had recommended among others the

prioritization of community participation and the use of local resources; partnerships and inter-sectorial linkages; effective teaching and learning through curriculum, training, instruction and assessment reforms; administration and management of human resources, and policy formulation, planning, implementation, and coordination in the delivery of education services in such settings [5]-[6].

It was postulated that REPLICA would lead to significant improvements in school level administration; aesthetics, stakeholder participation; peacefulness & gender sensitivity of schools, and learner participation in co-curricular activities consequent upon exposure to the intervention ultimately translating into better Net Intake, Completion and Pass Rates. In order to track the hypothesized effects and assess program effectiveness, the 3-ET tool (ie Evaluating Education in Emergency Tool) was therefore created through a multi-stage and participatory process. The instrument was piloted in 30 none project primary schools before being deployed in the 681 of the 1,800 project schools. The 681 schools had been sampled to participate in an inbuilt impact tracking study. Data for 270 of the 681 schools were randomly extracted using STATA release 11 for purposes of the current study.

Exploratory Factor analysis (EFA) was used to reduce the 88 variables of the original 3-ET to a smaller number of constructs [7] (Thompson et al., 1996): this approach has been used in other validation studies [8]-[14]. To Kerlinger (1979), EFA has been shown to be one of the most powerful methods for reducing variable complexity to greater simplicity [15]. McLeod et al., (1977) argues that the emergent factors may actually be used as variables in further analysis [16]. Kaiser criterion [17]-[18] and confirmatory scree plots [19] were used to select the factors and rotated factor load thresholds of 0.30, was applied as basis for item retention. Chronbach's alpha coefficient of 0.70 was adopted as threshold for internal consistence reliability acceptance. Interpretation of Pearson r coefficients was based on Cohen's recommendation [19] that coefficients of 0.10-0.29 are small, 0.30-0.49 are medium and 0.50-1 are large. STAT release 11 was used for data analysis. This paper discusses findings of the structural validity and internal consistency reliability analysis.

2. RESEARCH METHOD

2.1. Setting

The original data were collected from selected schools in the Northern and North Eastern regions of Uganda. This region had had war since 1986 and all the schools were affected. The adverse effects of the war on the local educational outcomes had motivated the introduction of the REPLICA program by the Ugandan education ministry. The primary data were collected from the primary schools-each of the 13 participating districts was represented. All the social services in the targeted region had been destroyed during the war and a large proportion of the population had been relegated into internal displacement camps. The data for the current study were collected between January and March 2007.

2.2. Design

This study employed a cross-sectional design.

2.3. Sample and sampling strategy

The original data were collected from 681 schools. The school selection had been done by the Ministry of Education and Sports (MoES) for purposes of tracking intervention impact. The process of selection was multi-staged and blinded. District Education Officials, in consultation with the Core Primary Teacher Colleges, had submitted lists of schools to the Education Ministry in response to a pre-defined inclusion and exclusion criteria that had been developed by the project staff. These primary lists of schools were then used by the MoES to draw a stratified random sample of 698 schools. The current study employs records of a random sample of 270 of the 681 schools.

2.4. Statistical analysis

The assessed psychometric properties of 3-ET were: (a) internal factorial structure i.e. the constructs underlying the wide-array of REPLICA program indicators and the extent to which they measure the specific dimensions of education revitalization. Factor retention was based on Kaiser Criterion, and confirmed through scree plots since Kaiser Criterion tends to overestimate the number of reliable factors. Varimax rotation was performed to determine structure parsimony. (b) Internal consistency reliability i.e. internal consistency of items in the emergent factors, were tested using Cronbach's Alpha. Variables with rotated factor loadings <0.30 were removed; in each case, reliability tests were run. This series of factor analyses and reliability tests continued until all variables had at least one >0.30 rotated factor loading and reliability coefficients stabilized: this approach has been widely used in the literature [7],[10]-[12]. To test whether

sub-scales measured distinct aspects of Educational revitalization, individual scale scores were summed and their relatedness were assessed using Pearson correlation tests. Non-significant correlations were considered indications of uniqueness.

3. RESULTS AND ANALYSIS

3.1 Sample characteristics

Data from a random sample of 270 primary schools from Northern and eastern Uganda were analysed.

3.2 Psychometric properties of assessment tool

The 88 variables of 3-ET, were reduced through exploratory factor analysis to 73. The [15] omitted variables were: signpost covered by grass or bush; Display of School map highlighting surrounding barriers to girls' education; Record of solutions or ways of minimizing the impact of above barriers; Latrines with lockable doors or an enclosure; Comments on schemes of work and lesson plan from Head teacher; Endorsed Teachers' attendance book; Vision of the school visibly displayed; Teaching and learning going on at time of visit; P.1 teaching & learning done in Local Language; Clear path leading to the school; Each class has a class teacher; Existence of sanitation prefect; Evidence of children's active participation in class; Schedule for cleaning the school; and Movable school signpost.

The retained variables were clustered in five distinct sub-scales (*as summarized in table 1*). Sub-scale (factor 1), with 20 items had rotated factor loads ranging between 0.31162 and 0.75402, with internal consistency reliability coefficient of 0.8788. It measured core education support functions. Sub-scale (factor) 2, assessed aesthetics/efficiency of service delivery. It had 21 items with rotated factor loads ranging between 0.37233 and 0.81262, and internal consistency reliability coefficient of 0.8821. Sub-scale 3, focused on barriers to stakeholder participation in the delivery of basic education services. It had 15 items, with rotated factor loads ranging between 0.34161 and 0.78808, and internal consistency reliability coefficient of 0.8867. Sub-scale 4 measured peacefulness and gender sensitivity of learning environments. It had 9 items, with rotated factor loads ranging between 0.31388 and 0.87415, and internal consistency reliability coefficient of 0.8045. Sub-scale 5 measured pupil participation in co-curricular activities. It had 8 items, with rotated factor loads ranging between 0.38487 and 0.77441, and sub-scale internal consistency reliability coefficient of 0.8126 (see table 1). Inter-factor Pearson correlation coefficients ranged between 0.3215 to 0.4504 (*as presented in table 2*). The findings show 3-ET to have sound psychometric properties, specifically structure, internal consistency reliability and sub-scale distinctiveness as evidenced by the rotated factor loadings (that ranged between 0.31 and 0.87), Cronbach's alpha coefficients (that ranged between 0.80 and 0.88), and Pearson correlation coefficients (that ranged between 0.32 and 0.45). The interpretation of [Pearson] correlation coefficients in the current study was guided by Cohen's recommendation.

From the findings, 3-ET clearly consists of five distinct sub-scales; the first sub-scale measures core education support functions and services; sub-scale/factor 2, aesthetics/ efficiency; sub-scale 3, barriers to stakeholder participation in basic education services; sub-scale 4 peacefulness and gender sensitivity of learning environments and sub-scale 5 pupil participation in co-curricular activities. The inter-factor Pearson correlation coefficients were medium, i.e. ranging between 0.3215 and 0.4504. The emerging sub-scales of 3-ET are consistent with the core issues addressed by the six components of the REPLICA program namely; school-based formal peace education, psychosocial support, community integration, leadership and governance, promotion of girls education and use of performing arts in learning. These sub-scales are therefore appropriate and can be used to track the hypothesized effects of the REPLICA intervention.

The procedures used in the current structural validation and reliability testing are standard and comparable to those used in other similar studies: particularly factor and variable retention criteria, Cronbach's alpha coefficient threshold and basis for interpreting Pearson correlation coefficients. This study was funded by The Pincer Group International Limited.

3.3 Limitation

A key limitation of our study is the fact that the authors did not explore the predictive validity of 3-ET; they did not also evaluate its applicability in non-war zones.

Table 1. Sub-scale structure with rotated factor loading

Table 1: Sub-scale structure with Rotated factor loading			
	Variable	Rotated Factor Loading	Cronbach's alpha (α)
Factor 1			
1	Existence of 2 rubbish pits	0.3439	0.8788
2	Indications of regular burning of rubbish	0.31162	
3	Clean Compound	0.33952	
4	Clean Toilets	0.31397	
5	Talking Classes	0.65607	
6	Display of time tables in respective classrooms	0.46688	
7	Head teacher's plan for lesson supervision	0.49105	
8	Displayed charts in P.1 in Local Language	0.66555	
9	Displayed charts in P.1 according to themes	0.63941	
10	Messages on outer walls of the buildings	0.50093	
11	Existence of a Guidance & Counselling room	0.59719	
12	Resting place in the G&C room	0.69309	
13	Displayed messages in the G&C room	0.65564	
14	Record of cases handled under G&C	0.68471	
15	Availability of G&C materials	0.68383	
16	Indications of use of G&C materials	0.71354	
17	A room for girls to uses as a washing facility (bathroom)	0.75402	
18	Changing room for girls	0.68266	
19	Water for washing hands after visiting the Toilet	0.32438	
20	Indications of regular hand washing	0.4047	
Factor 2			
1	Properly fixed school Signpost	0.66269	0.8821
2	Clear words on school signpost	0.71935	
3	Schemes of work signed and stamped	0.79323	
4	Lesson plans signed and stamped	0.81262	
5	Comments of schemes of work and lesson plans	0.78077	
6	Availability of files	0.7869	
7	Accessibility of files	0.77999	
8	Labelling of files	0.75214	
9	Current timetable displayed in office	0.55083	
10	Display of pupil enrolment figures	0.42595	
11	Evidence of pupil enrolment and analysis	0.45086	
12	School Mission visibly displayed	0.37541	
13	UPE accountability displayed in H/Teacher's office	0.50955	
14	Talking office/s	0.37233	
15	Record of analysis of teachers' attendance	0.49533	
16	Existence of 'subject leaders or heads'	0.53528	
17	Existence of staff committee or Teacher in charge of sanitation	0.50177	
18	List of PTA committee members displayed	0.55434	
19	List of SMC committee members displayed	0.48882	
20	Minutes of PTA meetings	0.43054	
21	Minutes of SMC meetings	0.52564	

Factor 3		
1	Displayed plan for School improvement	-0.38762
2	Record of activities accomplished as per School Improvement plan	-0.47535
3	Existence of a work plan for community involvement	-0.60638
4	Display of the above work plan	-0.64014
5	Record of activities accomplished by the community	-0.63186
6	Work plan for community sensitization activities	-0.65007
7	Display of the above work plan	-0.75615
8	Record of activities accomplished (under sensitization)	-0.6423
9	List of community outreach activities	-0.6804
10	Work plan for community outreach activities	-0.73919
11	Display of the above work plan	-0.78808
12	Record of accomplished community outreach activities	-0.70579
13	A plan for Public Engagement	-0.45746
14	Record of activities accomplished under Public Engagement	-0.4913
15	Record of departmental meetings held	-0.34161
Factor 4		
1	Existence of a Peace Club	0.87415
2	Existence of a Committee for Peace Club	0.86853
3	Activity Plan for Peace Club	0.74561
4	Record of accomplished peace club activities	0.68533
5	Aspects/values of peace incorporated in Schemes of work & lesson Plans	0.51576
6	Existence of a committee for GEM Club	0.70536
7	Activity Plan for GEM Club	0.76944
8	Record of accomplished GEM club activities	0.52617
9	Girls' latrines separate from boys' latrines	0.31388
Factor 5		
1	Functional PALS club	0.77441
2	A teacher in charge of PALS	0.51245
3	A work plan for PALS activities	0.56905
4	Existence of a practice schedule	0.56255
5	A book/file of activities accomplished by PALS club/s	0.48881
6	Availability of accessories for performing arts	0.68099
7	Record of work accomplished under class Supervision by the School Leader	0.38487
8	Compositions and creations on REPLICA	0.35626

Table 2. Pair wise correlation of the subscales/ factors

#	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	0.4452			
Factor 2	0.4504	0.44		
Factor 3	0.3624	0.361	0.3215	
Factor 4	0.4424	0.3758	0.4472	
Factor 5				0.3202

4. CONCLUSION

3-ET has acceptable structural validity and internal consistence reliability. It can therefore be used to test the effectiveness of the REPLICA intervention. Its applicability in other conflict and non-conflict contexts may need specific review.

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REFERENCES

- [1] Ministry of Education and Sports, "Basic Education Policy Support Program 2004-2006", *Kampala*, MOES 2004.
- [2] Roberts, B., Kaducu, FO., Browne, J., Oyok, T., Sondorp, E., "Factors associated with post-traumatic stress disorder and depression amongst internally displaced persons in Northern Uganda", *J Epidemiol Community Health*, vol/issue: 63:227-232, 2009. doi:10.1136/jech.2008.076356.
- [3] Magambo C., Lett R., "Post-traumatic stress in former Ugandan child soldiers", *The Lancet*, vol. 363, 2004.
- [4] Mutto, M., Khan, K., Lett, R., Lawoko, S., "Piloting an Educational Response to Violence in Uganda: Prospects for a New Curriculum", *African Journal of Injury Control and Safety Journal*, vol/issue: 7(2), pp. 37-46, 2009.
- [5] INEE, "Minimum Standards in Education in Emergencies", *Chronic Crises and Early Reconstruction*, 2004.
- [6] Lowicki, J., "Political Violence and Education: Missing out-Adolescents affected by armed conflict face few education opportunities and increased protection risks", 1999.
- [7] Thompson, B., Daniel, LG., "Factor Analytic evidence for the construct validity of scores: A historical overview and some guidelines", *Educational and Psychological Measurement*, vol. 56, pp. 197-208, 1996.
- [8] Mutto, M., Lawoko S., Ovuga O., Bangdiwala S., "Structural validity and reliability of the integrated conflict and violence scale", *Int J Inj Contr Saf Promot*, pp. 1-4, 2009. (PMID: 19946812).
- [9] Atlas JS., Metson BR., Singer DE., Wu AY., Gliklich RE., "Validity of a New Health- Related Quality of Life Instrument for Patients with Chronic Sinusitis", *The Laryngoscope*, vol. 115, pp. 846-854, 2005.
- [10] Lu YC., Lee JK., Xiao Y., Sears A., Charters K., "Why don't physicians use their personal digital assistants?", *Pro AMIA Symp*, vol/issue: 405(9), 2003.
- [11] Midge N., Ray MSN., Thomas KH., Feliciano BY., Nir N., Richard SM., Jeroan JA., Eta SB., "Development and testing of a scale to Assess Physician Attitudes about Handheld Computers with Decision Support", *Journal of American Medical Informatics Association*, vol/issue: 13(5), pp. 567-572, 2006.
- [12] Holms, CW, Shea AJ., "A New HIV/AIDS-Targeted Quality of Life (HAT-QoL) Instrument: Development, Reliability and Validity", *Medical Care*, vol/issue: 36(2), pp. 138-154, 1998.
- [13] Victorson ED., Enders KC., Burnett FK., Ouellette AE., "Injury Distress Index: development and validation", *Arch Phys Med Rehabil*, vol. 89, pp. 1983-1902, 2008.
- [14] Kerlinger, HF, "Behavioral Research: A conceptual Approach", New York: Holt, Rinehardt and Winston, 1979.
- [15] McLeod, JM., Brown, JD., Becker, LB., "Watergate and the 1974 congressional elections", *Public Opinion Quarterly*, vol. 41, pp. 181-195, 1977.
- [16] Brown, MW., "A comparison of factor analytic techniques", *Psychometrika*, vol. 33, pp. 267-334, 1968.
- [17] Catell RB., Jasper J., "A general Plasmode for factor analytic exercises and research", *Multivariate Behavioral Research Monographs*, vol. 3, pp. 1-212, 1967.
- [18] Linn RL., "A Monte Carlo approach to the number of factor problem", *Psychometrika*, vol. 33, pp. 37-71, 1968.
- [19] Cohen J., "Statistical Power Analysis for the behavioral sciences", 2nd ed, Hillsdale: Lawrence Erlbaum Associates, 1988.

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Dr. Milton Mutto is a violence prevention, project management, research, program development, and monitoring and evaluation specialist with advanced training in Epidemiology, Biostatistics, Global Health, Sociology and Physical Rehabilitation. He is a founding board members of the Mentor VIP program of WHO. He is also a member of the Violence prevention Alliance of the WHO and of the Global forum for Child welfare. He is Co-author of the UNICEF/WHO world report on Child Injury Prevention and of the Africa Report on Violence and Health. Milton has been part of the Global alliance working towards a UN treaty of Small arms and Light weapons. He was the Principle Investigator of the 5 year USAID/GOU Peace Education Project in over 1500 schools in Northern and Eastern Uganda. He has extensive knowledge of the decentralization governance system in Uganda. He also coordinated multi country studies on the health burden of small arms. He has extensive experience working in conflict settings in the Horn of Africa and Uganda with special interest in local innovations that address perennial problems caused by conflict and violence in different communities. Milton was the Principle Investigator of this study.



Ms Immaculate Mukasa is an Economist and M & E specialist; she is a Self-driven, Management Specialist with graduate training in Economic Policy and Planning, training in Public Administration and management and bachelors training in Economics. Immaculate is experienced in strategic management in competitive NGO settings, Administration and Procurement and logistics management. She also has experience in the management of Staff welfare schemes. Immaculate was a co-investigator in this study.



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Mr. Kilibo has 15 years' post-qualification working experience microfinance, Accounting, training, and project planning & management. Mr. Kilibo also has an excellent understanding of Uganda's financial system and especially the microfinance sub-sector. Charles has had a number of specialised training courses both locally and internationally. Immaculate was a co-investigator in this study.



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